Should Bankers Be Concerned with Intellectual Capital? A Study of the Thai Banking Sector

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SHOULD BANKERS BE CONCERNED WITH INTELLECTUAL CAPITAL? A STUDY OF THE THAI BANKING SECTOR

Abstract

Purpose - This study examines the causal effect of intellectual capital (IC) performance on the financial performance of Thai listed banks.

Design/methodology/approach - Data is collected from 16 listed banks in Thailand in the period of 1997-2016. This paper uses Value-added Intellectual Coefficient (VAIC) methodology suggested by Pulic (1998, 2004) to measure intellectual capital. This study employs the Fixed Effect, Random Effect model and Generalized Method of Moments (GMM) estimator to investigate the causal effect of IC on financial performance.

Findings - The results show that banks' profitability is driven mainly by Capital Employed Efficiency (CEE) to make a profit. However, the Human Capital Efficiency (HCE) marginally reduces the banks' profitability in current period but yield positive effects on future profitability.

Research limitations/implications – Firstly, this study doesn't cover data of foreign banks which reduces the generalization of the results. Secondly, items from financial statements can be manipulated by accounting adjustments. Lastly, subsequent research should control more banks' characteristics such as banks' ownership, non-performing loan ratio, and R&D expenditures.

Practical implications - Banks should not only manage its physical and financial capital effectively but also improve employee's efficiency to reach a higher future profitability level.

Originality/value - This paper contributes to the ongoing literature about IC in the banking sector in emerging countries. Moreover, this paper is the first to employ GMM method in banking context to address the possible endogeneity problem.

Keywords - Intellectual Capital; VAIC; Financial performance; Banking sector; Thailand.

Paper type - Research paper.

1. Introduction

Before the information society, people traditionally focus on input factors such as labor, capital, and resources while other intangible components gradually come in and take the top position in companies' operation and survival. In particular, knowledge, information technologies and intellectual factors are the principal activities for organizations to be efficient on the market and to obtain sustainable competitive advantage (Gogan et al., 2016).

Along with the emerging recognition of IC, the accounting occupation has not addressed the problem of measuring and reporting the results of knowledge-based entities (Eckstein, 2004). During the era of knowledge, where IC is considered as a significant part in the value of the products manufactured by companies, the regular reporting systems only show a partial structure of IC such as the value of intangible assets (royalty fee, license, and trademarks). It is a shared understanding that financial statements do not attempt to provide actual value of companies. By doing this, the value of intangible factors is underestimated. Moreover, it is noticeable that the current accounting standards rarely recognize the intangible investments (Zéghal and Maaloul, 2010). Therefore, the introduction of comprehensive and attuned information on IC in the company reports has been a permanent claim of stakeholders.

To meet such demand, many methods have been developed to measure the impact of IC on creating value and increasing the financial performance of companies (Edvinsson and Sullivan, 1996; Edvinsson, 1997; Kaplan and Norton, 1996; Roos et al., 1997). Being one of attempts to measure IC, Pulic (1998, 2004) developed a model to analyze VAIC as an IC measurement. In general, VAIC is an analytical procedure designed to enable management, shareholders and other relevant stakeholders to effectively monitor and evaluate the efficiency of value added by a firm's total resources and each major resource component (Firer and Williams, 2003, p.352). Most of the recent studies utilized this model to measure the relationship between IC and the financial performance (e.g., Al-Musali and Ismail, 2014; Meles et al., 2016; Ozkan et al., 2017).

One the other hand, banking system is an ideal environment to perform research about IC because it is known as one of the most knowledge-intensive industries (Firer and Williams, 2003). Firstly, the operation of banking process relates tightly to the connection with customers to create competitive advantages. Secondly, the products of banks are not manufacturing goods but services of which value based on IC. Finally, to provide clients with best services, banks

have to invest in human resources, brand names, systems, and processes. Thus and it is essential for banks to control their IC as efficiently as possible.

Additionally, Thai banking system in is an interesting subject for the research of IC. Young et al. (2009) compared the IC performance of commercial banks in eight Asian economies from 1996 to 2001. Using VAIC method, they indicate that Thailand has the greatest improvement in IC performance. However, it is known that Thailand was the first country to suffer from the Asian financial crisis in 1997. Although it happened a long time ago, there is still a need for research on Thailand banking system which helps them to understand the importance of IC and maintain their sustainability. Moreover, due to the globalization, competition in banking industries has become fierce more than ever, so the pressure on bank's performance has increased. Before the crisis of 2008, we could notice that most banks made a profit by pushing the risks to their investments. As a result, the global crisis happens. After that, governments tried to control the banking sector by setting more regulations regarding various mergers and acquisitions of banks or new policies such as Basel framework. Therefore, banks are now seeking profit by solving how to manage effectively to establish sustainable operations and increase profitability.

This paper is motivated to fill these gaps in the literature of existing debate featuring mixed findings of the causal effects between VAIC, its components and financial performance. First, we would like to adopt the VAIC model developed by Pulic (1998, 2004) to measure the IC performance of 16 listed banks in Thailand in the period of 1997-2016. Then, we further investigate the relationship between IC and the financial performance and determine which components contribute to the profitability the most in the context of Thailand.

This study contributes to the literature in such a way that it provides understandings and how to evaluate the IC performance in Thai banking sector. Moreover, it also helps to identify the potential role of IC in bank financial performance in Thailand. On the other hand, this paper also contributes to the ongoing literature of the determinants of banking profitability (e.g., Menicucci and Paolucci, 2016; Garcia and Guerreiro, 2016; Petria et al., 2015). It may not only help banks to improve their profitability, but it also supports policymakers in fulfilling the financial stability goal. Finally, in consideration of possible endogeneity problem and the dynamic feature of banks' profitability, we would like to employ the GMM model which was not widely used before to ensure that our estimation results are robust.

The results provide the evidence on the presence of a relationship between IC's components and the financial performance. In particular, the efficiency of using physical and financial capital significantly drives banks' profitability. Human Capital Efficiency slightly reduces the return on assets in the same period but increases profitability after three quarters on average. In this sense, it is necessary to pay special attention to the capital employed by managing them effectively. Moreover, it suggests that banks should consider the employee's efficiency to improve future profitability level.

The remainder of this study is structured as follows. Following this introduction, Section 2 provides the theoretical basis with the topic of the research. In Section 3, data, definitions of variables and methodology are presented to analyze the mechanism by which IC improves profitability. Section 4 shows the empirical results, related discussion and robustness check, followed by the concluding remarks in Section 5.

2. Literature Review

There are several reasons why the concepts of IC are still in an ongoing debate. There is no universally accepted definition for IC as it is discussed in various disciplines and perspectives including economics, strategy, finance, accounting, human resources, reporting and disclosure, marketing and communication. Additionally, the concepts of IC are not only often ill-defined but also lack of agreement across various definitions (Marr and Moustaghfir; 2005). To make a point of the differences in IC definitions; for example; Edvinsson and Sullivan (1996, p. 358) defined IC simply as "knowledge that can be converted into value." Stewart (1997, p. x) added more details and defined IC as "intellectual material – knowledge, information, intellectual property, experience – that can be put to use to create wealth" while Marr and Moustaghfir (2005, p. 1116) stated "Intellectual capital embraces any valuable intangible resource gained through experience and learning that can be used in the production of further wealth." As a consequence, it leads to the struggle to researchers and industrial experts for measuring IC and its components.

This study employs the VAIC method which was proposed by Pulic (1998, 2004) to measure IC due to its advantages. Iazzolino and Laise (2013) addressed VAIC in both conceptual and methodological aspects. In evaluating Pulic's proposal contribution in the literature, they critically review and clearly explain what Pulic means and then, identify the conceptual misunderstandings of the terms used in VAIC model. On the other hand, they compared Pulic's approach with those from his criticizers and found that his method does not

modify or contradict any of the fundamental accounting principles in terms of methodological point of view. In a nutshell, they indicate that Pulic's model is innovative, both theoretically and methodologically. Empirically, VAIC model is widely employed to measure the relationship between IC and the financial outcomes and confirm a positive correlation between them. For example, Meles et al. (2016) used a sample of 5,749 banks from 2005 to 2012 in the U.S. to prove that VAIC positively affects the financial performance of banks. Moreover, this study also found that Human capital – a component of VAIC efficiency – has a larger impact on banks' performance compared to other elements. Al-Musali and Ismail (2014) showed that VAIC performance positively associated with banks' financial performance and HCE has a significant impact on returns on assets and returns on equity by using the data of listed banks in Saudi Arabia. Joshi et al. (2013) used VAIC method to investigate the IC performance in Australian financial sector for the period 2006-2008. They found that human capital highly influenced the value creation capability of the financial sector in Australia. Moreover, the results show that VAIC and its components performance differs across all subsectors. In particular, investment companies rely to a high level of human capital to earn higher value of VAIC while insurance companies focus on the physical capital lowering their VAIC level. Ting and Lean (2009) examined the IC performance and its relationship with the financial performance of financial institutions in Malaysia from 1999 to 2007. They revealed that VAIC positively correlated with returns of assets (ROA) in Malaysian financial sector. In addition, they showed that the variance of HCE, CEE and structural capital efficiency (SCE) helps to explain 71.6 percent of the variance of ROA. Kamath (2007) focused on Indian banks from 2000 to 2004. The results indicate that top performers in HCE are clearly the foreign banks while the top performers in CEE were the public sector banks. Furthermore, foreign banks are the top performers in the value creation efficiency analysis. He also explains that the public sector banks seem to have a large and inefficient workforce which does not contribute anything to overall value creation.

Regarding the context of Thailand, there are some previous studies investigating the causal effect of IC on the financial performance using VAIC model approach. Phusavat et al. (2011) used the data of leading manufacturing firms listed on the stock exchange of Thailand 100. They identify that IC positively and significantly affect firms' performance. Appuhami (2007) used the sample of 33 banking, insurance, and finance companies in Thailand in 2005. Using VAIC approach, the empirical research found that IC has a significant positive association with investors' capital gains on shares. Saengchan (2007) obtained half-year bank-

level data including commercial banks registered in Thailand (Thai banks) and foreign banks' branches from 2000 until 2007. He estimated the relationship between VAIC, its components and the financial performance including ROA and Cost to Assets using linear multiple regression analysis. The results show that there is a strong association between the IC efficiency and banks' financial performance.

Although the literature shows that there should be positive effects of IC performance on the profitability, some studies indicate contradicting results against this hypothesis. Using the VAIC method to examine this relationship, Ozkan et al. (2017) showed that IC (measured by VAIC) has no statistically significant correlation with financial performance by using data from Turkish banking sector. However, when they break down the components of VAIC, HCE is the most crucial factor that drives the profit of banking sector in Turkey. On the other hand, Chang and Hsier (2011) also discovered that IC creates an adverse impact on its financial and market performance using a sample of 367 Taiwan semiconductor companies. Morariu (2014) used the sample of 72 Romanian firms listed on BSE in 2010. In this paper, it is suggested that there is a significant association between the VAIC and market value while there is no relationship between VAIC and Return on Equity and Asset Turnover ratio.

Regarding econometric aspect, we suspect that VAIC and its components can be endogenous by omitted variables and reverse causality. Omitted variables can cause estimation bias through the discrepancies in unobserved individual characteristics across banks as well as the time-varying factors that have an impact on both financial performance and VAIC (e.g., financial crisis). Reverse causality is more problematic when financial performance can affect the VAIC. For instance, high profitable banks can offer a higher bonus level to their employee which has an impact on Human Capital Efficiency or banks can use their retain earnings to reinvest in physical and financial assets which drives the Capital Employed Efficiency.

Turning to estimation method, we notice that many papers use simple regression method to estimate the causal effect of IC on financial performance. For example, Joshi et al. (2013) used multiple linear regression on ROA (dependent variable) and components of VAIC. Similarly, Al-Musali and Ismail (2014) employed the linear regression to estimate the relationship between VAIC, its components and the financial performance. However, possible endogeneity problem as mentioned above can make OLS estimation results in a bias and inconsistent estimator. Thus, Ozkan et al. (2017) used Fixed and Random Effect model to control for individual specific characteristics among banks. Although Fixed Effect Model control for the time-invariant unobserved characteristics, it cannot control for the unobserved

variables that change over time (Allison; 2009). It is argued that this method can produce a consistent estimation when we assumed that there is no correlation between idiosyncratic errors and independent variables. However, this assumption can be violated by time-varying unobservable variables (such as financial shock) or reverse causality (VAIC affects financial performance). Taking into account for endogeneity problem, Meles et al. (2016) used OLS estimation and check for estimation's robustness by using one time lagged independent variables. However, we would like to use another approach such as GMM to tackle the endogeneity problem as well as consider the dynamic nature of bank's profit. GMM method has been used in VAIC analyses due to its advantage such as addressing endogeneity problem. For example, Kehelwalatenna and Premaratne (2014) employed GMM method to estimate the impact of IC on performance of U.S. banking from 2000 to 2011. Nadeem et al. (2016) used the same estimation method in the case of listed firms in U.K. for the period of 2005 to 2014. Zheng et al. (2018) examined the two-way relationship between human capital efficiency and risk-taking behavior and capital regulation in the case of Bangladesh.

3. Methodology and Data

3.1 Overview of Thai banking system

In emerging countries, banking sector plays a crucial role in the economy where most companies are financed by bank's loan. Thailand is not an exception, commercial banks accounted for around 46 percent of total assets of the financial institutions in the end of quarter 3 in 2016. On the other hand, they accounted for approximately 73 percent of the total shares of corporate loan and 41 percent of the total shares of consumer loan (Bank of Thailand, 2016).

After the Asian financial crisis in 1997 which first started in Thailand, the government implemented two policies to restructure the banking sector. In particular, merger and acquisition among Thai banks and foreign banks were allowed. For example, DBS Bank acquired 50.3 percent of Thai Danu Bank in 1998, 75 percent of Radanasin Bank was acquired by United Overseas Bank Limited in 1999, and Standard Chartered Bank acquired 75 percent of Nakornthon Bank in 1999. In addition, the government wanted to attract the inflow capital so they adjusted the maximum limit of foreign shareholdings of Thai commercial banks from 25 percent to more than 49 percent under the new Financial Institution Business Act (implemented in August 2008). It is expected that foreign banks help to bring new capital, management experiences and new banking products while resolve the high level of non-performing loan from the crisis.

As a consequence, Thai banks are gradually recovered in term of loans, deposits and total assets. For example, total assets of all Thai commercial banks steadily increase from 6,000 to approximately 18,000 billion Baht from 2001 to 2016. The similar increasing trend is also found for loans and deposits. On the other hand, the net profit shows a fluctuation during the period. From 2002, the net profit increases from 20 billion to 100 billion in 2005. However, it drops significantly in the financial crisis in 2007 and then recovers to around 200 billion in 2016 (Bank of Thailand, 2018).

3.2 Measurement of IC

The VAIC model uses items on balance sheets and income statements to calculate IC performance. VAIC is measured as follows:

$$VAIC_i = CEE_i + HCE_i + SCE_i$$

Where $VAIC_i$ is the Value Added Intellectual Coefficient of bank i. CEE_i (Capital Employed Efficiency) indicates the marginal contribution per each unit of physical and financial capital to the value added. HCE_i (Human Capital Efficiency) shows the marginal contribution of human capital per each unit of human capital to the value added. SCE_i (Structural Capital Efficiency) measures how structural capital contributes to value-added (Meles et al., 2016). In general, this method tries to measure the contribution of physical and financial, human and structural resources to create value-added for banks. By these definitions, each of these components is defined as follows:

$$CEE_i = \frac{VA_i}{CA_i}$$

$$HCE_i = \frac{VA_i}{HC_i}$$

$$SCE_i = \frac{SC_i}{VA_i} = \frac{VA_i - HC_i}{VA_i}$$

In these computations, VA_i is defined as the value added to the banks. In other words, it is the subtraction of all the input from the output in banks operation. In particular, the income statements structure shows the similar concept. It reports the total revenue generated by banks and then minus all the related cost and finally come up with the Profit before tax. In this paper, we choose to use the sum of Profit before tax and the Payroll expenses to represent the value added because the Profit before tax indicates the residual value after eliminating all the costs

out of revenues. Moreover, we need to add back the Payroll expenses because it is excluded out of Profit before tax. CA_i is the physical and financial capital of banks. We can notice that this concept is similar to tangible assets, so it is calculated by the Total Asset minus Intangible Assets (including Goodwill). Thus, CEE is equivalent to VA divided by CA to indicate the efficiency of how banks use physical and financial capital. According to Iazzolino and Laise (2013), Pulic defines the term HC (Human capital) as the amount of capital invested in knowledge workers such as wages, salaries, and training while SC can be intended as the conditions that enable human resources to produce VA which is, in other words, the share of VA residually after deducting investments in IC obtained by the SC holders. Therefore, we use Payroll expenses to represent the HC because this account records wages, salaries of employees which is widely used in previous studies (Kehelwalatenna and Premaratre, 2014; Meles et al., 2016; Ozkan et al., 2017). However, training expenses may not be perfectly captured in this account because it may be recorded under various accounting sections under current accounting system depending on the purpose and how the training is set up. Thus, this particular information is not available in financial statements. Conceptually, the ratio of VA and HC indicates the efficiency of human capital in creating value added. On the other hand, SC is measured as the remaining value of VA after deducting HC while SC divided by VA indicates the efficiency of structural capital.

By analyzing the relationship between the efficiency of IC and financial performance of banks, VAIC, and its components are used as indicators of IC efficiency. As such, VAIC and its components: CEE, SCE, and HCE are independent variables employed in the model. On the other hand, ROA is utilized as an indicator of the financial performance which is measured as the ratio of profit before tax to total assets. This measure of profitability is used in many similar studies (Al-Musali and Ismail, 2014; Ozkan et al., 2017; Meles et al., 2016)

Similar to Meles et al. (2016), to manage the banks' characteristics, we control for three variables: banks' size, measured as the natural logarithm of banks' total assets; credit risk is calculated by dividing allowance for doubtful debt to total loans. This ratio shows how much bank provisions relative to its total loans; liquidity risk, indicating what percentage of the assets of the banks are tied up in loans, is calculated as total loans over total assets. The summary of the variables used in this paper is presented in Table 1.

[Table 1]

The relationship between the VAIC performance and the financial performance (ROA) is tested. Then, the components which have provided the most severe impact on ROA of Thai's

banks are identified.

Thus, we propose four models which are presented as follows:

Model 1: $ROA_{it} = \beta_0 + \beta_1 VAIC_{it} + \varepsilon_{it}$

Model 2: $ROA_{it} = \beta_0 + \beta_1 VAIC_{it} + \beta_2 ALOAN_{it} + \beta_3 LOANTA_{it} + \beta_4 SIZE_{it} + \varepsilon_{it}$

Model 3: $ROA_{it} = \beta_0 + \beta_1 CEE_{it} + \beta_2 HCE_{it} + \beta_3 SCE_{it} + \varepsilon_{it}$

Model 4: $ROA_{it} = \beta_0 + \beta_1 CEE_{it} + \beta_2 HCE_{it} + \beta_3 SCE_{it} + \beta_4 ALOAN_{it} + \beta_5 LOANTA_{it} + \beta_6 SIZE_{it} + \varepsilon_{it}$

Where:

- $ALOAN_{it}$ is the credit risk of bank i at time t ($ALOAN_{it}$ = Allowance for Doubtful Debt/ Total Loans)
- $LOANTA_{it}$ is the liquidity risk of bank i at time t ($LOANTA_{it}$ = Total Loans/ Total Assets)
- $SIZE_{it}$ is the banks' size of bank i at time t (Natural Logarithm of Total Assets)

The above models are used to test four following hypothesis:

H1. There is a positive causal effect of IC performance (VAIC) on financial performance (ROA) of listed banks in Thailand.

H2. There is a positive causal effect of capital employed efficiency (CEE) on financial performance (ROA) of listed banks in Thailand.

H3. There is a positive causal effect of human capital efficiency (HCE) on financial performance (ROA) of listed banks in Thailand.

H4. There is a positive causal effect of structural capital efficiency (SCE) on financial performance (ROA) of listed banks in Thailand.

3.3 Data

This paper uses an unbalanced panel data of quarterly financial information of 16 listed banks in Thailand from 1997 to 2016. After the crisis of 1997, many regulations have been used to control banks. Thus, the number of banks varies over these years in unbalanced panel data. Moreover, we only use the separated financial statements because the consolidated reports may include some subsidiaries such as real estate or securities companies which may cause

bias in nature of banks. The data is collected from bank's official website. Table 2 shows that the data used in this research can represent the majority of Thai banking system. In particular, it accounts for approximately 77.91% of the total assets of all the commercial banks in Thailand at the end of 2016.

[Table 2]

4. Empirical results

The descriptive statistics are summarized in Table 3 as follows:

[Table 3]

Table 3 demonstrates the average value of the VAIC variables and its components of listed banks in Thailand from 1997 through 2016. Throughout this time, there are 16 banks, many of which were newly established or ended its operation. It can be inferred from the table that LH Financial Group (LHBANK) and Thanachart Bank (TCAP) are the banks with the highest VAIC among all banks. On the other hand, banks with lowest VAIC are Industrial Finance Corporation of Thailand (IFCT) and Tisco Financial Group (TISCO). We can notice that among all three components of VAIC, the most crucial element that drives VAIC is HCE which accounts for the highest proportion of VAIC. This result is consistent with other countries such as Saudi Arabia and Turkey (Al-Musali and Ismail, 2014; Ozkan et al., 2017).

Another noticeable feature of Table 3 is that we spot some negative value of VAIC. To have an exact understanding of this phenomenon, we need to trace back to each component of VAIC and its formula. As above, HCE plays a major proportion in VAIC, and not surprisingly, the negative VAIC is driven by the negative HCE. On the other hand, HCE is calculated by dividing value added by the personnel expenditure which represents the ratio of profitability that bank makes per unit of staff cost. However, negative HCE means that banks make a loss while still paying salary. In conclusion, if VAIC measure utilizes profitability as an indicator, making loss will show a negative VAIC measure.

We can observe some abnormal ratio such as HCE of LHBANK and TISCO. In further investigation, we notice that these cases caused by significant fluctuations in payroll expense in some quarters. It can be explained that the headcounts in newly established banks observed a huge change. An alternative explanation is that the financial statement in some period contains accounting adjustments. Thus, when we take the average value, it is affected by these abnormal figures. However, these numbers do not frequently show up in the data, and they all

are audited as listed banks at year end. Therefore, we capture all the values to see the whole picture of the banking system in Thailand.

However, the approximate figure of VAIC can be obtained by not to include these extreme values in the descriptive statistics, so we ignore the top and bottom 1% of the data to eliminate the extreme value problem in this data set. Then, Thanachart Capital (17.3832), Tisco Financial Group (4.9256) and LH Financial Group (4.5976) are the banks with the highest average VAIC in Thai banking system. On the other hand, the banks with the negative average VAIC includes The Industrial Finance Corporation (-3.3072), DBS Thai Danu Bank (-2.1070), United Overseas Bank (-0.7031) and UOB Radanasin Bank (-0.3972). Overall, the average VAIC in Thai banking system is estimated at 2.4079.

4.1 Diagnostic tests

Pearson correlation analysis in Table 4 illustrates that there is a statistically significant positive correlation between ROA and VAIC, CEE and HCE. Among the independent variables, CEE is the variable with the highest correlation with ROA. SCE has a negative but statistically insignificant relationship with ROA. It is observed that there is no substantial correlation between independent variables. This result suggests that multicollinearity problem between independent variables is weak or none – existent. Moreover, it is confirmed by VIF (Variance Inflating factor) among variables. All the recorded figures are lower than the rule of thumb by 10.

[Table 4]

Firstly, it is necessary to perform the unit root test because of the long time series data. A unit root causes the time series a systematic pattern that is unpredictable. Therefore, Im-Pesaran-Shin unit-root test for key variables including dependent variable ROA, independent variable VAIC, and its component is performed with the null hypothesis "H_0: All panels contain unit roots". The results indicate that all the p-value is zero, so the null hypothesis is rejected. Thus, the dataset used in this study is concluded to be stationary. Moreover, we also check for autocorrelation by performing the Wooldridge test for autocorrelation in panel data. The results show that there is no first-order autocorrelation model 1, 3 and 4 while model 2 observes this problem.

Secondly, we perform Modified Wald test for group-wise heteroskedasticity to test for the heteroskedasticity in four models. The result shows that the p-value of all four models is

less than the significant level of 1%. Thus, heteroskedasticity problem exists, so the heteroskedasticity-consistent standard errors are used. All of the related tests are showed in Table 5.

[Table 5]

In the awareness of the autocorrelation in model 2 and the heteroskedasticity in all four models, we apply heteroskedasticity-consistent standard errors as known as robust standard errors option (specifying the *vce(robust)* option) in Stata which can produce a consistent variance-covariance matrix estimator. (Stata Corporation, 2013, p.372)

Thirdly, we don't apply Pooled OLS because unobserved effect such as managerial, banks' efficiency will result in the inefficient estimators. Thus, we perform both random and fixed effect model for all four models to account for differences across the banks (see Ozkan et al., 2017). Then, we perform Hausman test to identify whether random or fixed effect model is preferred. The result shows that the model 1 and 2 two are estimated using random effect model while model 3 and 4 are determined using fixed-effect model.

4.2 Fixed-effect and random-effect model

Table 6 demonstrates the relationship between the profitability of the banks operating in Thailand and their IC. When the explanatory power of the models is compared, it can be concluded that R^2 values (0.9948 and 0.9947, respectively) of the model 3 and 4 are higher than the R^2 value of the model 1 and 2 (0.0062 and 0.1685, respectively). This result shows that the components of VAIC are better explaining the profitability of banks than the VAIC alone. This conclusion is consistent with the results in the Turkey banking system (Ozkan et al., 2017). On the other hand, there is no strong correlation among VAIC components as tested by Pearson correlation analysis as above; therefore, including all three components may not bias the estimation results.

[Table 6]

It can be inferred from the model 1 and 2 that there is a positive statistically insignificant relationship between VAIC and financial performance indicator (ROA) from 1997-2016. In other words, VAIC does not affect the bank's profitability. When we decompose VAIC into three components HCE, CEE and SCE, model 3 and 4 illustrate that CEE has the high positive correlation with ROA. In contrast, HCE shows a weak negative relationship with

financial performance. Finally, there is no statistically significant association between SCE and ROA.

On the other hand, the credit risk (ALOAN) indicates a negative relationship with financial performance in model 2 while model 4 shows that this correlation is insignificant. Similarly, high liquidity risk (LOANTA) reduces the profitability in both model 2 and 4. However, bank's size is proven to have a positive impact on bank's profitability, but this result is inconsistent because of statistical insignificance coefficient in model 4.

4.3 Dynamic panel data estimation - GMM

In the context of the relationship between IC and performances, there are growing studies using GMM approach due to its capability against endogeneity problem (e.g., Kehelwalatenna and Premaratne, 2014; Sardo and Serrasqueiro, 2017; Anifowose et al., 2018). In this section, we use the dynamic GMM estimation of Arellano–Bond model (Arellano and Bond, 1991). In general, GMM estimator utilizes the lagged dependent variables as instruments in the procedure of two-stage least squares. The first advantage of this estimator technique is to control for potential endogeneity issue by using internal instruments. Secondly, this method also contributes to understand the dynamic nature of profitability which means the profit of current period can be influenced by the previous period.

There are two requirements need to be met for the validity of GMM's results: (1) second-order autocorrelation should not exist in the model and (2) the validity of the over-identification restrictions created by the used of instruments. Thus, related tests are conducted and shown in Table 7. It can be inferred from the table is that our results survive the autocorrelation test AR(2) because we fail to reject the null hypothesis "no autocorrelation". On the other hand, Sagan (1958) and Hansen (1982) tests of over-identification restrictions show an inconsistent conclusion about the over-identification in the model. However, since autocorrelation and heteroskedasticity (non-spherical errors) are suspected in the previous section, the Sargan statistic is inconsistent (Roodman, 2009). Thus, we follow the result from Hansen test and conclude that we fail to reject null hypothesis "the instrumental variables are uncorrelated to the residuals". Thus, the instruments are exogenous which ensures the validity of GMM model.

[Table 7]

Overall, as showed in Table 7, the results are in line with those presented in Table 6. Once again, the VAIC doesn't significantly associate with ROA while the HCE and CEE show

the similar conclusion with fixed and random effect model discussed above. On the other hand, the one-quarter lagged ROA shows insignificant correlation with current ROA. Although the dynamic nature of bank's profitability have been confirmed in the literature (e.g., Pervan et al., 2015; Sinha and Sharma, 2015), it is likely that a quarter is too short for past profit to take effect on current profit. In reality, retained earnings is the past year must be approved at shareholders' meeting to decide how much to distribute as dividends or reinvest in business which can improve profit in this year. Thus, the dynamic effect of profitability may exist in longer period.

4.4 Robustness check

We conduct a sensitivity analysis by excluding the period from 1997 to 1999 in our estimation. We suspect that this timeframe includes the impact of the Asian financial crisis started in 1997 and its lagged effects afterward. Thus, we re-estimate our model by excluding the year of 1997 to 1999 to avoid crisis effect. Another approach is that we add dummy variables to control for both the crisis period which is in the year of 1997 – 1998 and 2007 – 2009. We find that results reported are very similar to those reported previously (Table 8 and Table 9).

[Table 8]

[Table 9]

It is suggested that the impact of the crisis period does not influence our core result about the VAIC, its component and the financial performance in Thai banking sector significantly. As mentioned before, we also perform analysis our model with trimmed data of 1% the highest and the lowest value for key variables (HCE, SCE, CEE, and VAIC). The results are still robust when we remove the outliers in data (see Table 10).

[Table 10]

4.5 The dynamic aspect of IC on performance

In previous literature, the dynamic aspect of IC has been considered because researchers suspect that the effects of IC on financial performance exist not only in current period but also in the future. Empirically, the lagged value of VAIC is confirmed to beneficial the current profitability (e.g., Clarke et al., 2011; Meles et al., 2016; Sardo and Serrasqueiro, 2017). To avoid multicollinearity, we step-by-step consider one, two and three lag-step of VAIC and its

components in our models. Particularly, we use lagged one-quarter VAIC in model 1 and 2 while lagged one-quarter HCE, CEE, and SCE in model 3 and 4. After that, we repeat the estimation using two-quarter lag and then three-quarter lag separately. The results of the one lag-step and two lag-step VAIC and its components indicate that IC have no impact on current profitability. However, Table 11 illustrates that three-quarter lag VAIC and HCE are positively associated with the current ROA, suggesting that VAIC and HCE has a positive effect on banks' future profitability.

[Table 11]

4.6 Discussion

As Thailand is still a developing country and its banking system hasn't fully developed yet, the findings of this study suggest that profitability of Thai banking sector is primarily driven by capital employed efficiency (CEE) which is in line with previous studies (Ozkan et al., 2017; Ting and Lean, 2009). Additionally, structural capital efficiency (SCE) is proven to be statistically insignificant with ROA. Ting and Lean (2009), Josie et al. (2013), Ozkan et al. (2017), Meles et al. (2016), Al-Musali and Ismail (2014) also showed that SCE does not correlate with financial performance in Malaysia, Australia, Turkey, U.S and Saudi Arabia respectively.

Human capital efficiency (HCE) seems to illustrate that human capital marginally reduces the profitability. This result is in line with previous research (Saengchan, 2007). Similarly, Morariu (2014) also found that Human Capital Efficiency is negatively correlated with market value (measured by market-to-book value) and productivity (measured by asset turnover ratio). One possible explanation for this result is that the occurrence of mergers and acquisitions throughout the period in Thailand as mentioned before. In this procedure, downsizing is likely to result in the significant increase cost of employees due to severance indemnities and other compensations.

Due to the mixed results of VAIC components to financial performance, VAIC is showed to have a statistically insignificant relationship with the financial performance. This outcome is consistent with several previous studies such as Joshi et al. (2013) for Australian context, Ozkan et al. (2017) in Turkish banking system.

Another interesting result we obtained from the estimations is that HCE is positively related to banks' profitability in three-quarter period. This finding is consistent with the fact that investments in human capital are likely to bring future benefits (e.g., Clarke et al., 2011;

Meles et al., 2016; Sardo and Serrasqueiro, 2017). The delayed effect of human capital investment on profitability may be caused due to the management style or processes within banks. Thus, HCE appears to take longer to have an effect on banks' performance.

5. Conclusions

To adopt the new trend of employing intellectual capital in the business, there is a new line of research about this topic, and it is becoming more extensive than ever. Many approaches have been proposed to provide insights, understanding and even measurement method. Applying in a knowledge-intensive industry like banking in Thailand as an emerging country, this paper hopes to provide an overview of intellectual capital in Thai banking system, its measurement and its connection with financial performance. In this study, the IC efficiency of 16 banks operating in Thailand between 1997 and 2016 is estimated using the Value Added Intellectual Coefficient (VAIC) approach. Then, this paper focuses on how IC and its components affect the financial performance of these banks using GMM method. The result reveals that VAIC does not correlate with banks' financial performance. Regarding the VAIC components, CEE has the highest contribution to banks' profitability. However, HCE shows a slight opposing effect on banks' performance in current period but yield positive effects on future profitability. Therefore, CEE can be considered as the main driver of commercial banks in Thailand.

This research is subject to some limitations. Firstly, this study only considers listed banks in Thailand, which doesn't involve the shares of foreign banks which are likely to employ more IC from developed countries. The results obtained from those banks in the comparison with Thai banks provide great understandings of IC as competitive advantages. Secondly, as banks is an special institution which have own characteristics, it is necessary to include more control variables such as banks' ownership, non-performing loan ratio or R&D expenditures to isolate the contribution of IC to banks' profitability. Thirdly, accounting manipulation and adjustments can be included as we use items from financial statements.

Several practical implications can be suggested from this study. As the results imply that Thai banking sector still operates based on the traditional resources such as financial and physical capital to make a profit, bank's managers should focus on how to use and manage its financial and physical resources effectively to reach a higher level of profitability. Turning to the human capital efficiency, although it marginally reduces banks' profitability in current

period, it is necessary to strengthen the personnel structure and employee's efficiency to improve the future profitability. Having positive effect of human capital on future profitability, managers should invest in human capital such as continuous trainings to improve employees' performance. Although the beneficial outcomes of HCE are not likely to have immediate effects, employees are valuable assets that should not be neglected for banks to maintain competitiveness in the market. In addition, given that structural capital efficiency have not shown a favorable effect yet and only a small proportion of human capital efficiency affect profitability which indicates that IC has not yet been fully exploited yet as a driver of profit. Thus, it opens a new field of research in the industry which suggests that managers should focus on how to utilize IC to create competitive advantages over their competitors. In other words, IC is still a new aspect among determinants of bank's profitability, and it needs to be investigated to maximize banks' profit. As Thai banking system is still on the way of recovery and developing, it needs a major innovation not only to maintain sustainability but also to grow steadily in this competitive industry. The results of this research help to understand the role of IC and its importance in Thai banking system. Thus, IC should be put as a consideration in planning for future strategy.

For further research, it is necessary to consider more components of VAIC such as relational capital including the relationship with internal and external stakeholders or R&D potential upon the IC development. These approaches can capture more aspects to have a broad overview of IC. On the other hand, we so far use the items from financial statements (based on accounting profit) which can be easily affected by accounting manipulation and adjustments. Instead, it is better to use Market-To-Book ratio or value-based measures such as Economic Value Added (EVA) or shareholder value added (SVA) as complement to traditional accounting performance measures.

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